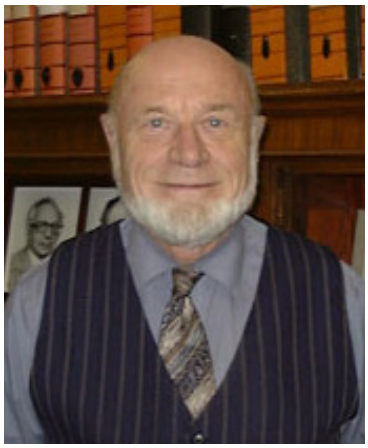
UNIVERSITY OF MARYLAND

THE BURGERS PROGRAM FOR FLUID DYNAMICS
THE FLUID DYNAMICS REVIEWS SEMINAR SERIES

MASS DIFFUSION AND THERMODIFFUSION IN MULTI-COMPONENT FLUID MIXTURES



Friday, February 3, 2023 | 11am

DeWalt Seminar Room
2164 Glenn L. Martin Hall

Speaker

JAN V. SENGERS

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ABSTRACT

While the subject of mass diffusion and thermodiffusion in binary fluid mixtures is well understood, the issues regarding mass diffusion and thermodiffusion in multicomponent fluid mixtures are more complex. In contrast to mass diffusion coefficients and thermodiffusion coefficients of binary fluid mixtures, mass diffusion coefficients and thermodiffusion coefficients of multicomponent fluid mixtures depend on the representation used to specify the composition of the mixtures, i.e., whether mass fractions, mole fractions, or volume fractions are used. This problem causes considerable complexity comparing and using experimental diffusion coefficients reported by different authors, even for the same mixtures. This seminar will show how one can redefine mass diffusion and thermodiffusion coefficients of multicomponent fluid mixtures, so that they become independent of the frame of reference by applying a simple transformation to the Fick's law and thermodiffusion relations in terms of matrices that only depend on the known composition of the mixtures. Solution of this problem has become pertinent, since more and more experimental diffusion data, at least for ternary mixtures, are currently becoming available. Reporting diffusion data in terms of these frame-independent mass diffusion and thermodiffusion coefficients would greatly facilitate use of experimental diffusion data for practical applications.

BIO

Jan V. Sengers is a physicist and a Distinguished University Professor Emeritus at the Institute for Physical Science and Technology of the University of Maryland. He is known for seminal contributions in critical and non-equilibrium phenomena in soft condensed matter. He received his Bachelor's degree in Physics and Mathematics in 1952, his Master's degree in Physics in 1955, and his Ph.D. in Physics in 1962, all cum laude, from the University of Amsterdam. Jan Sengers has been instrumental in the establishment of the Burgers Program with being a founding member of the Burgers Board and held the position of Chair from 2003-2006. Among his many honors and awards, he is an elected Fellow of the American Association for the Advancement of Science, the American Physical Society, the American Society of Mechanical Engineers, the American Institute of Chemical Engineers (AIChE), the International Association for the Properties of Water and Steam, the World Innovation Foundation and the International Union of Pure and Applied Chemistry and Academician Emeritus of the International Academy of Refrigeration of the Russian Federation and is Correspondent, Royal Netherlands Academy of Sciences.

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